



**North Carolina Hosted Call  
Handling and Call Processing  
Equipment  
(CPE)  
Conceptual Design document**

April 2016

## Table of Contents

|      |  |    |
|------|--|----|
| 1.   | NC NG9-1-1 HOSTED CALL HANDLING CONCEPTUAL DESIGN.....             | 5  |
| 1.1  | Overview.....  | 5  |
| 2.   | CPE High Level Requirements .....                                  | 7  |
| 2.1  | System Sizing .....  | 7  |
| 2.2  | Equipment.....   | 7  |
| 2.3  | CPE Requirements .....   | 10 |
| 2.4  | Availability and Reliability.....                                  | 11 |
| 2.5  | Geo-Diversity .....  | 11 |
| 2.6  | NG9-1-1 Functionality .....  | 12 |
| 2.7  | Multi-media Support.....   | 13 |
| 2.8  | Future-proofed Architecture .....                                  | 14 |
| 2.9  | Interoperability .....   | 14 |
| 2.10 | Remote Positions.....  | 14 |
| 2.11 | Reporting and Data Collection System Requirements .....            | 15 |
| 2.12 | Event Reports .....  | 16 |
| 3.   | CPE Functionality .....  | 17 |
| 3.1  | Connectivity .....   | 17 |
| 3.2  | Distributed Denial of Service (DDoS Attack Prevention).....        | 17 |
| 3.3  | Protocols.....   | 18 |
| 3.4  | Bandwidth .....  | 18 |
| 3.5  | CPE Administration and Maintenance .....                           | 18 |
| 3.6  | Threat Detection .....   | 19 |
| 3.7  | Automatic Location Identification Retrieval System Interface ..... | 19 |
| 3.8  | Network and System Clock.....                                      | 20 |
| 3.9  | Alternate Routing Capability .....                                 | 20 |
| 3.10 | 9-1-1 Transfers .....  | 20 |
| 3.11 | Selective Transfer .....   | 21 |
| 4.   | Call Operations .....  | 22 |
| 4.1  | System Diagrams.....   | 22 |

|      |  |    |
|------|--|----|
| 4.2  | Abandoned Call Information .....                                   | 22 |
| 4.3  | Automatic Call Detail Record .....                                 | 23 |
| 4.4  | Redundancy.....  | 23 |
| 4.5  | Future Expansion.....  | 23 |
| 4.6  | Maintenance Access.....  | 23 |
| 4.7  | Instant Recall Recorder .....                                      | 24 |
| 4.8  | Logging Recorder Interface .....                                   | 25 |
| 5.   | CPE System Functions .....   | 26 |
| 5.1  | Call Presentation .....  | 26 |
| 5.2  | Call Taker Logon .....   | 26 |
| 5.3  | Ring-tone and Trunk-Line Functionality .....                       | 26 |
| 5.4  | Call Answering.....  | 27 |
| 5.5  | Call Distribution.....   | 27 |
| 5.6  | Routing Status .....   | 28 |
| 5.7  | Sound Quality .....  | 28 |
| 5.8  | Graphical User Interface .....                                     | 28 |
| 5.9  | Status Windows .....   | 29 |
| 5.10 | Automatic Number Identification (ANI).....                         | 29 |
| 5.11 | Automatic Location Identification (ALI).....                       | 29 |
| 5.12 | Telecommunication Device for the Deaf/Teletype (TDD/TTY) .....     | 30 |
| 5.13 | Hosted CPE System Capabilities.....                                | 31 |
| 6.   | CAD Interface .....  | 34 |
| 7.   | Management and Monitoring Requirements .....                       | 35 |
| 7.1  | Administrative Monitoring.....                                     | 35 |
| 7.2  | Monitoring of Applications and Equipment.....                      | 36 |
| 7.3  | Simple Network Management Protocol Version 3 (SNMPv3) Support..... | 36 |
| 7.4  | Network Fault Monitoring .....                                     | 36 |
| 7.5  | Network Performance Monitoring .....                               | 36 |
| 7.6  | Maintenance Support.....   | 36 |
| 8.   | Operations .....   | 37 |
| 8.1  | First-Echelon Troubleshooting .....                                | 37 |



|     |   |    |
|-----|---|----|
| 8.2 | Customer Service Plan .....                 | 37 |
| 8.3 | Warranties .....                            | 38 |
| 8.4 | Updates, Upgrades and or Replacements ..... | 38 |
| 8.5 | Maintenance Spares .....                    | 38 |

# **1. NC NG9-1-1 HOSTED CALL HANDLING CONCEPTUAL DESIGN**

## **1.1 Overview**

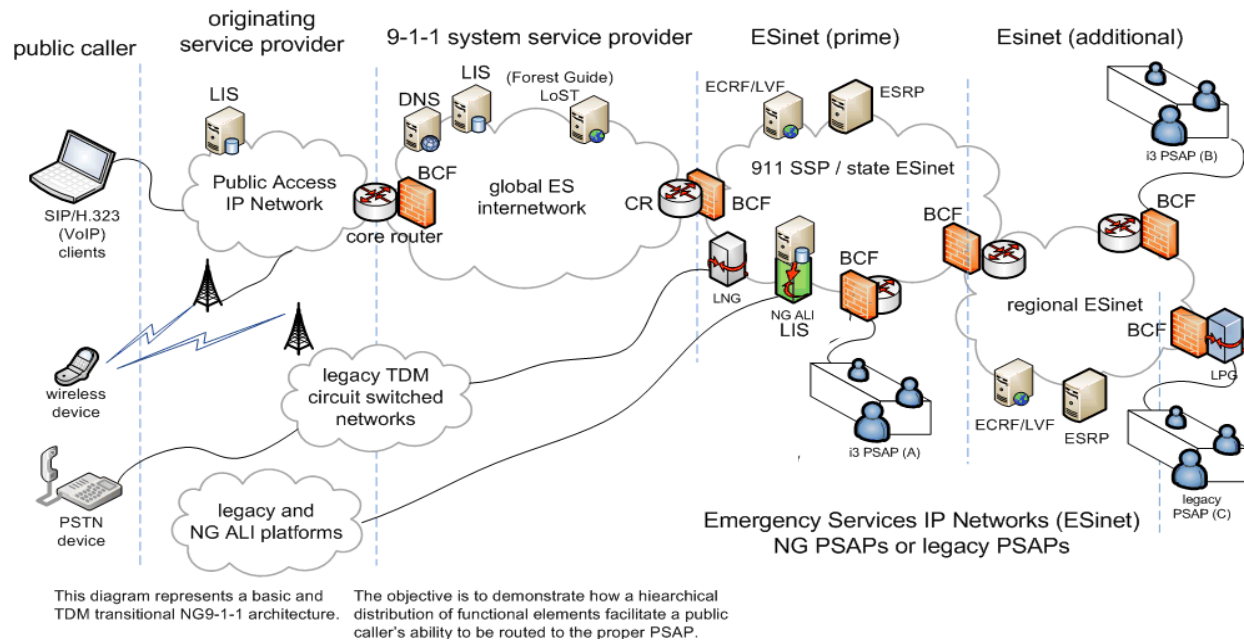
This document describes the system requirements, functional requirements, regulations and industry standards with which the North Carolina NG 9-1-1 Hosted Call Handling platform must comply as well as tasks that will be the responsibility of the Vendor selected to implement the platform. References to a Vendor, Vendors or selected Vendor(s) in this document assumes the responsibility of monitoring and managing the quality of the products and actions to implement the Hosted Call Handling solution. The design of the desired solution is a reliable and system-stable solution to facilitate the handling and processing of emergency calls for some of the approximately 125 primary and approved secondary PSAPs in North Carolina.

The Hosted Call Handling System Call Processing Equipment (CPE) will be connected to the core of the ESInet as a geographically diverse interconnected platform and housed within a minimum of two Data Centers on the ESInet or in the Vendor's Tier 3 or better data centers connected to the ESInet in at least two geo-diverse locations. Initially the geo-diverse CPE will accommodate PSAPs that have existing CPE that is at end of life, or are utilizing equipment that cannot provide IP capable NG9-1-1 service.

Per the National Emergency Number Association (NENA) i3 standard, the state of North Carolina CPE will be IP-based and shall fully comply with current NENA i3 standards for NG9-1-1 implementation. The CPE system must be capable of receiving and delivering Session Initiation Protocol (SIP) messages to the PSAPs that will connect via the ESInet. The CPE will provide the ability to process information for both data and voice traffic.

The State expects that the CPE will be a commercially available, and proven commodity that has a verifiable installed base and supported by certified local technicians. Transition to a fully operational NG9-1-1 system will occur over time. The State is implementing an ESInet as part of their migration to NG9-1-1. The expectation is that PSAPs will begin migration to the ESInet in 2018.

The objective for the NG9-1-1 system aligns with the NENA NG9-1-1 future path plan as shown in Figure1.



**Figure 1 – NENA NG9-1-1 Future Path**

## **2. CPE High Level Requirements**

### **2.1 System Sizing**

The CPE will eventually be able to accommodate many if not most of the approximately 125 primary and approved secondary PSAPs in North Carolina and the statewide 2015 call volume of 7.3 million 9-1-1 calls. Currently there are up to 840 primary answering positions. In addition there are remote positions that are configurable “on the fly”, which may be necessary to ensure alternate and contingency routing.

However, the state of North Carolina understands that not all PSAPs will utilize the CPE platform initially. Therefore the actual number of PSAPs using the CPE for call handling will grow over time. Currently the timeline for phasing all PSAPs onto the ESInet calls for a 5-year migration period ending in or near 2020.

The successful bidder’s CPE solution must be able to support a flexible and scalable configuration that will accommodate PSAP locations and meet the expected call volume over time.

The equipment used to provide the service to the PSAPs must be sized appropriately to handle the expected growth. Vendors will be encouraged to propose a platform that is capable of supporting the entire call volume of 9-1-1 calls even though some variable less than that amount will be used initially. The objective is to create a solution that may allow for adding “cards” or “blades” as the State grows rather than more equipment.

### **2.2 Equipment**

The hosted CPE system must provide the same level of service and appearance to the PSAP as though the CPE were installed locally. It is very important to ensure that the day-to-day PSAP operations mirror as closely as possible what each PSAP does today to minimize any disruption in service or require extensive additional training. The CPE must allow call takers to answer 9-1-1 calls, non-emergency/administrative calls, ring downs, VoIP, TDD/TTY Text to-from 9-1-1, and make outbound calls.

The hosted CPE will meet all applicable standards, requirements and specifications to ensure that the configuration meets applicable standards including, but not limited to:

- Underwriters Laboratories (UL)
- International Organization of Standards (ISO)
- Open System Interconnection (OSI)
- Institute of Electrical and Electronics Engineers (IEEE)

- American National Standards Institute (ANSI)
- Electronic Industries Alliance (EIA)
- Telecommunications Industry Association (TIA), (including ANSI/EIA/TIA-568 Commercial Building Telecommunications Wiring Standards)
- NENA i3 standards

Availability, redundancy, resiliency and reliability of the CPE solution will be a critical component of the operation. CPE will be implemented to allow for continuity of operations across the ESInet. For example, if a PSAP is unreachable by the primary route there must be an alternative geographically diverse route to ensure that no calls are blocked, delayed, or dropped. Furthermore, the CPE must have no single points of failure within the system or at the PSAP demarcation point.

If the CPE in one data center fails for whatever reason the CPE in the other data center(s) must be capable of routing all calls and ensure that calls in progress are not “lost”.

The CPE will deliver the following functionality and be designed and implemented to achieve the following:

- An expandable switch configuration that results in a non-blocking fault tolerant platform.
- An expandable switch capable of scaling to meet the expected demand over time without replacing the hardware components also known as a forklift upgrade.
- Every interface port will be able to detect and generate tones associated with 9-1-1 call delivery and will support audio conferencing directly at the PSAP and through the ESInet.
- A failure within an active operational component will result in an automatic failover switch to a second server automatically resulting in no loss of service or capability.

NG9-1-1 functional elements will be located in multiple geo-diverse Tier 3 data center locations.

The hosted CPE solution will interface with current and future technologies. The CPE design and implementation will include a projected roadmap that identifies:

- Potential decommission of existing equipment that may be eliminated at the PSAP



- Capabilities for integration of the CPE with CAD system(s) currently in use at the PSAP
- Flexible mapping capabilities to allow integration with existing mapping systems
- Coordination with existing local 9-1-1 system service providers to ensure routing of calls to the CPE and out to the PSAP
- Future technologies and enhancements to the hosted CPE, either planned or under consideration
- Commercial availability with a proven track record and identifiable installed base
- Ability to provide end-to-end IP connectivity and the delivery of Session Initiation Protocol (SIP) calls to the PSAPs
- Ability to send real-time call detail records (CDR) for any active 9-1-1 call and administrative call to a third party collection device (ECaTS) fully operational with the ECaTS CDR system
- Access for custom configuration changes either made by an authorized PSAP support person or by the Network Monitoring and Assistance Center (NMAC).
- The ability for administrative lines to terminate on the system and be configured to allow the backhaul of administrative line traffic
- SNMPv3 compliant performance data output to be monitored by the NMAC

The preferred configuration will have a minimum of two physical CPE units each that process the packets for voice and data. The hosted CPE operation shall provide the following functionality at a minimum:

- The hosted CPE will be implemented in a hosted fashion that performs the functions of an ANI/ALI controller system and interface directly to ESInet for connectivity to the PSAPs.
- In the event of a failure of the active CPE, switchover to the second CPE must be automatic and result in no loss of active 9-1-1 calls or service.
- The system configuration must have non-blocking, fault-tolerant switching which expands with the addition of interface cards.

- Every interface port will have dedicated resources to detect tones, generate tones and support audio conferencing.
- Power to each system will be delivered to the equipment such that the failure of a single power supply permits the redundant systems to function without loss of ability to process calls.
- Vendors must provide CPE specifications for power, heating, cooling, and uninterruptable power supply, as standard even if the CPE solution is located in the Vendor's Tier 3 data center.
- NG9-1-1 routing service equipment will be in geo-diverse locations which include geographically diverse data centers with geographically diverse connection to the ESInet.
- Site infrastructure shall be fault-tolerant with expected availability of 99.999 percent availability measured monthly.
- Quality of service (QoS) information must be accessible to the Network Monitoring and Assistance Center (NMAC).

## **2.3 CPE Requirements**

The CPE will be capable of hosting multiple PSAPs that are remote to the CPE. These locations will require the ability to process calls to/from PSAPs, up to 840 positions and multiple telecommunication service providers. Each individual PSAP will access the CPE through the ESInet. To accomplish this, the CPE must:

- Be configured to avoid 9-1-1 calls from being "lost"
- Adhere to NENA i3 and NG9-1-1 switch standards
- Be designed to support the negotiation of call fidelity via G.711
- Meet the industry standard up time of 99.999 percent (5 9's).
- Comply with NENA i3 for the delivery of callback and location information to CAD, mapping applications and voice recorders
- Be capable of delivering location information to CAD and mapping applications via IP without requiring a hardware or software upgrade

- Be compatible with the legacy 9-1-1 system (This configuration requirement ensures that legacy 9-1-1 is stable for all PSAPs including those utilizing a legacy 9-1-1 system while connecting to the ESInet; or those who are using another NG9-1-1 compatible solution in lieu of the CPE.)

## 2.4 Availability and Reliability

The CPE will be implemented to meet the 99.999 percent goals of reliability and availability. As defined by IEEE:<sup>1</sup>

*Reliability is the ability of a system or component to perform its required functions under stated conditions for a specified period of time.*

*Availability is the degree to which a system or component is operational and accessible when required for use.*

The CPE solution must be designed and configured within the ESInet to deliver 99.999 percent up time measured on a monthly basis.

Any predictable maintenance or upgrade process affecting hardware, firmware or software that would require the proposed solution be removed from service for any length of time must be identified and communicated to the Network Management and Assistance Center (NMAC) prior to the action.

Availability will be measured according to the following calculation:

$$A = \frac{UpTime}{(UpTime + DownTime)}$$

Reliability will be measured according to the following calculation:

$$R_a = \frac{Successes}{Attempts}$$

Together, the CPE must maintain a reliable and available platform for PSAPs to utilize.

## 2.5 Geo-Diversity

The CPE implementation must be in a redundant configuration. The ESInet may be used in physical and logical diversity for the geo-diverse CPE. Therefore each CPE must have

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<sup>1</sup> Institute of Electrical and Electronic Engineers

multiple physical geographically diverse connections to the ESInet to prevent a single point of failure. The equipment may comprise multiple CPE servers in a geo-diverse arrangement. CPE equipment locations in the geo-diverse configuration must be identified and adhere to the design criteria outlined in this document.

The hosted CPE must allow interconnection of stand-alone CPE systems that may require additional transition and migration activities prior to fully utilizing the hosted system. This may require a virtual separation between an A-side and B-side for some PSAP implementations. The CPE hosts must be configured as survivable nodes within the NG9-1-1 ecosystem. The primary metric of the potential geo-diverse configuration and mandatory requirement is that the hosted CPE will not allow 9-1-1 calls to be “lost” due to a local issue present within the configuration.

## **2.6 NG9-1-1 Functionality**

The hosted CPE configuration design and implementation must ensure scalability and the ability to expand without a substantial upgrade. The desire is to implement a platform capable of meeting the NENA i3 capabilities and NENA 08-003v2 standard.

PSAP migration through the ESInet to the hosted CPE will occur over a period of time. Therefore the hosted system must also be capable of delivering legacy 9-1-1 traffic while offering NG9-1-1 functionality across the same common system.

The hosted CPE must integrate with, and allow configuration to the ESInet and support each of the following NG9-1-1 functional elements:

- Emergency Call Routing Function (ECRF) call routing functionality once that feature is implemented
- Location Validation Function (LVF) and Location Information Server (LIS) interconnection to allow access to location based routing functions
- GIS capabilities for modifying data records
- Mapping systems operated through CAD or CPE locally at the PSAP
- Emergency Service Routing Proxy (ESRP) ability to route emergency services via a proxy routing server specifically for delivering NG9-1-1 calls and data
- Border Control Function (BCF) and session border control integration to increase the firewall and security of the NG9-1-1 ecosystem

- Legacy Network Gateway (LNG) performance to legacy networks that are not IP capable
- Legacy PSAP Gateway (LPG) performance to PSAPs that are not IP capable or NG9-1-1 compliant
- Legacy Selective Router Gateway (LSRG) performance to legacy selective routed network providers.
- Text-to-9-1-1 capability that may require an interface to a Text Control Center
- Text-from-9-1-1 capability that may require an interface to a Text Control Center
- CAD interfaces to the PSAPs and the ability to create an interoperable CAD solution
- Radio interoperability to allow radio to follow the calls as they are transferred

## ***2.7 Multi-media Support***

NG9-1-1 will provide the ability for new call types. The hosted CPE design will support the call types identified as part of the initial design. As standards evolve for new potential call types not currently identified, the hosted CPE solution must offer a modification to the design to ensure that the system can continue to operate during the contracted period.

The NC NG9-1-1 Board and the individual PSAPs will determine when they wish to enable the call types within the system. It may be necessary to have multiple scenarios operating within the NG9-1-1 system at any time. New call types include instant messaging, SMS text, MMS text, video messaging and alarms, sensors and other emergency monitoring utilities. The Hosted CPE will provide the capability to utilize other new call types, if any, as introduced into the industry.

The CPE solution will support multi-media solutions that may initiate a 9-1-1 call including:

- Instant Messaging
- Text-to-9-1-1
- Text-from-9-1-1
- Multi-media Messaging
- Video Messaging
- Alarms, sensors, telematics

## ***2.8 Future-proofed Architecture***

The hosted CPE solution will be designed to future-proof the state of North Carolina against the requirement for a “forklift” upgrade of hosted CPE equipment at any time during the transition to NG9-1-1. The CPE must be commercially available and remain viable for a minimum of 5 years to enable transition to occur to the primary NG9-1-1 call handling system.

Since the State anticipates upgrades to the CPE or revisions to the software, the roadmap for the future of the CPE solution should include such upgrades and revisions.

The hosted CPE must maintain the same level of service as if the CPE were located at the PSAP. Ideally, the hosted CPE platform will improve the reliability and service over the current legacy configurations.

Criteria to meet the requirements include:

- Availability, reliability, redundancy and resiliency as governed by NENA standards
- Parity among all services and for all potential 9-1-1 callers
- 100% call and data delivery through the system to the PSAP

## ***2.9 Interoperability***

The hosted CPE will support interoperability and expansion of interoperability with other potential agencies and Vendors as necessary. The hosted CPE must be configured to avoid the introduction of special modules or other components required to implement a particular capability or a proprietary solution to achieve interoperability.

## ***2.10 Remote Positions***

The hosted CPE will support the deployment of remote workstations, telephone sets or other stations if necessary.

The hosted CPE will continue to operate seamlessly and transparently if any remote positions are used. All remote workstations must provide the same functionality and access as the current local PSAP positions. Remote positions may include mobile command units and back-up 9-1-1 centers.

## ***2.11 Reporting and Data Collection System Requirements***

The state of North Carolina utilizes the Direct Technology ECaTS system for system statewide reporting and data collection. The hosted CPE must allow integration and full functionality for the State to continue to utilize the ECaTS platform. The hosted CPE Vendor must develop the plan, design and manage the implementation of all hardware and software to install the reporting framework that integrates with ECaTS. This may require the Vendor to independently coordinate activities with ECaTS during this process. If the Vendor offers another reporting system, it must provide reports and information not obtainable from ECaTS. ECaTS will remain the primary call detail reporting platform.

The alternate reporting and data collection system must provide for linking the secure user ID login and password in use with the ECaTS system and include the ability to enforce minimal password requirements.

The proposed reporting and data collection system must support role-based access:

- Allowing authorized users to have access to reports from ECaTS for the entire NG9-1-1 system
- Allowing some users to have access to PSAP report information only
- Allowing some functionality to show only to certain users and not to everyone

The proposed reporting and data collection system must allow scheduling of automatic report generation.

Typical data capture capabilities include:

- Electronically capture and buffer Call Detail Records (CDR) at each individual PSAP and populate the ECaT
- Securely capture call, text and operational data
- Ability of the buffering device to batch CDR payload, stamp it with capture time, encrypt it and deliver the CDR data using a secure and encrypted methodology
- Seamlessly report PSAP and larger jurisdiction 9-1-1 call statistics from one web-based location regardless of the CPE at the PSAPs
- Capture of information regarding the state of North Carolina's NG9-1-1 overall system performance

- Provide a color coded graphical dashboard, or map view of the NG9-1-1 systems health

## ***2.12 Event Reports***

Event reporting shall record the timing of transit for each payload for purposes of diagnostics. All event reports must, at a minimum, include the functional element being reported and the system time of such event.

The system must provide, at a minimum, the following event reports:

- Time of payload entry through BCF
- Time for each functional element to perform routing and PSAP assignment
- Time of answer at PSAP
- Time of disconnect at PSAP



## **3. CPE Functionality**

### **3.1 Connectivity**

The hosted CPE will utilize the ESInet to connect to the PSAPs. The ESInet design supports:

- Connections to the local service providers currently providing legacy E9-1-1 call delivery and selective routing for 9-1-1 calls
- Connections from ESInet to the PSAPs

The State expects the location of the hosted CPE will be the same as the core of the ESInet (or reachable from the core of the ESInet over multiple geographically diverse connections) and will be directly linked to the NG9-1-1 functional elements operating within the ESInet. The Vendor will be responsible for proper design and implementation, of the connections entering and exiting the ESInet. The hosted CPE is the primary intelligence for the NG9-1-1 call delivery platform; therefore, the hosted CPE connectivity design must include:

- Fault tolerance
- Documentation of all legacy gateways to ensure routing functionality for all call types
- Security measures including vulnerability minimization either through denial of service attacks or other malicious activity be avoided
- Connectivity including the assurance that all connections are capable and functional for IP and NG9-1-1 call delivery to the PSAP
- Operation on a 24x7x365 basis including all typical and normal operating conditions, including system updates, system refreshes, equipment and /or hardware replacements

### **3.2 Distributed Denial of Service (DDoS Attack Prevention)**

Depending upon the hosted CPE location, the potential for a DDoS attack may occur regardless of the ESInet protection. This is especially true if the CPE is hosted outside of the ESInet with connectivity to the network. While the ESInet is prepared to minimize and eliminate DDoS, the hosted CPE implementation must also have the ability to restrict DDoS attacks. The hosted CPE must not allow access by an outside resource through

attacking the Domain Name Server (DNS), attacking a specific protocol or through packet flooding.

If a DDoS mitigation service is used, the 9-1-1 Vendor must provide details regarding the configuration and outline the DDoS strategy.

### **3.3 Protocols**

The hosted CPE will utilize the ESInet and be implemented for IP network connectivity. Call delivery will utilize the Session Initiation Protocol (SIP) to those PSAPs that are NG9-1-1 capable. Configuration of other PSAPs that are not NG9-1-1 capable will allow them to continue using a Centralized Automatic Message Accounting (CAMA) circuit-based network. The hosted CPE configuration must operate with both protocols without failure. By 2020 all PSAPs will be connected to the ESInet.

The hosted CPE will have the ability to receive emergency calls via wireline, wireless, internet, voice over IP.

### **3.4 Bandwidth**

The basis of the calculation of bandwidth requirements for the hosted CPE will be the position count, call volume and quantity of PSAPs to ensure a sufficient amount of bandwidth is available to meet the entire expected call load during peak times. Calculation of bandwidth should include the potential for additional, supportive and supplemental data delivered to the PSAP. CPE bandwidth must be capable of expansion as needed.

### **3.5 CPE Administration and Maintenance**

Implementation of administration and monitoring of the hosted CPE must allow for local and remote visibility. The administration and management tools must allow access by the NMAC to identify alarms and make the appropriate notification to have the alarm corrected. This includes the ability to coordinate in the creation of trouble tickets and the management, escalation and resolution of the trouble.

The administration and maintenance tools must allow for:

- Communication and coordination directly with the NMAC for all administrative and maintenance activities
- A single point of administration and management for upgrades to software, revisions to operating systems and security updates

- A secure virtual private network (VPN) tunnel configured solely for remote administration
  - The NMAC must have details of the VPN tunnel to ensure the internetworking between the VPN and the ESInet.

### **3.6 Threat Detection**

All publically accessible connections to the hosted CPE require additional protection against security attacks from outsiders. All network interfaces to the hosted CPE that utilize a public Internet connection must be documented and provided to the NMAC. Documentation must include the IP address, protocol operation and system function to allow for administration and operational control in the event threats are detected. Documentation provided to the NMAC must also include known open ports within the system. These known open ports require careful monitoring to ensure detection and avoidance of threats, even if those threats are from inside the ESInet.

- Implementation of any firewalls in conjunction with the hosted CPE require delivery of the configuration of the firewall and routing tables to the NMAC.
- Additional methods for threat detection will require review by the state of North Carolina Department of Information Technology and the NMAC.
- The NMAC must receive real-time logs of activity.

### **3.7 Automatic Location Identification Retrieval System Interface**

The CPE provider must assume the use of Automatic Location Information (ALI) to determine location for a period of time until migration of the ALI system to the hosted CPE. Therefore, the hosted CPE will interface to an ALI database utilized at each PSAP. This may require connectivity to an external location where the ALI information is stored. The CPE provider will ensure that any connection to an external ALI provider will be redundant and secure. This will also require direct coordination with the ALI provider and the PSAP to develop a configuration and transition of the ALI system to the hosted CPE platform to enable seamless transfer of call data to the PSAP.

- The hosted CPE must support advanced NENA Extensible Markup Language (XML) tags for standardized data exchange.

- The hosted CPE must store ALI data received from third-party ALI databases (e.g., telco ALI database).
- The hosted CPE must support the ability for automatic ALI rebid.
- The hosted CPE must support manual ALI queries from the PSAP workstation.

### ***3.8 Network and System Clock***

The CPE solution will require an interface to a master clock for synchronization. Implementation of the clock may be internal to the ESInet to support all PSAPs that utilize the hosted CPE for call processing. The network and system clock functionality must comply with NENA Standard 04 002 v4.

Some PSAPs may connect to the ESInet and not use the hosted CPE for call handling. In this case, the ESInet and CPE clock sources must derive timing from a common source to ensure consistency of time stamps added to event records and reports from all NG9-1-1 host equipment. The master clock shall be available to all PSAPs for synchronization of all the equipment located within the PSAP.

### ***3.9 Alternate Routing Capability***

The configuration of the hosted CPE must allow the routing of calls to an alternate PSAP location if the primary PSAP location is busy or unavailable at a selected route. Alternate and contingency routes must be configurable to allow proper routing through the ESInet to an available PSAP with the resources necessary to handle the call volume. These routes may be statically defined based upon bandwidth calculation figures initially.

Alternate routes must be dynamically configurable via a policy routing function or through an interface with a proxy server specifically for routing decisions. Any change in route must be communicated to the NMAC to maintain the administrative and operational control of call delivery to all PSAPs.

### ***3.10 9-1-1 Transfers***

The hosted CPE will allow for transfer of a 9-1-1 call to any other position internal to the ESInet, and externally to a remote location along any provided secure network to another PSAP or dispatch point. The primary function of the CPE will allow transfer of a 9-1-1 call by the call taker at a PSAP to a call taker at another PSAP.

All 9-1-1 and administrative calls require this regardless of legacy or NG9-1-1 compatibility. Transfer capabilities must also be developed for transferring calls to other destination(s) that may require information to support a call, such as military installations.

### **3.11 Selective Transfer**

The hosted CPE must include the ability to populate a list of responding agencies by discipline (law enforcement, fire, EMS, etc.), based on the ALI information presented at the PSAP. This function may be configured to utilize a separate window display, and may also allow the call takers to use a map display at some PSAPs to geographically select transfer locations via a map.

The hosted CPE will allow connected users the ability to connect to or initiate calls to responders through a single mouse click, keystroke, or keypad entry. This feature requires the following attributes:

- Selective transfer information must be updated dynamically to avoid discrepancies and minimize errors.
- Any populated selective transfer list must allow call takers the ability to sort and filter the contents to allow for selection of the proper contact in a rapid manner.

## **4. Call Operations**

This section presents specific call operations processes and procedures required at the PSAP. The Vendor or service provider and the hosted CPE itself must support the following areas.

### **4.1 System Diagrams**

The hosted CPE requires accurate as-built information in the form of configuration diagrams, subnet plans and implementation punch lists. The NMAC will utilize all documentation between the hosted CPE and interconnections to the ESInet that provide call delivery and NG9-1-1 functions to support the administration and operation of the system. The documentation must show:

- Hosted CPE locations and configuration
- Hosted CPE connectivity and redundancy
- NG9-1-1 system connectivity
- Hosted CPE specific NG9-1-1 functionality including connectivity to legacy providers
- Equipment utilized for creating the CPE capability
- Any hardware components that represent a potential access point to the network that could present a vulnerability

### **4.2 Abandoned Call Information**

The hosted CPE design must support the collection of Automatic Number Identification (ANI) digits and processing the ALI lookup regardless of the condition of the call: active or on-hook.

- The hosted CPE will collect the ANI data immediately after a trunk seizure event on the 9-1-1 trunk and then process the ALI lookup.
- The ANI of the abandoned caller shall be available for viewing by the call taker and the abandoned call shall remain in queue with still active 9-1-1 calls.

### ***4.3 Automatic Call Detail Record***

The hosted CPE will capture the Call Detail Record automatically, and store all available information pertaining to all calls irrespective of call type, on the server that allows access by or connectivity to the ECaTS system for statewide reporting purposes.

### ***4.4 Redundancy***

The hosted CPE configuration must be such that any failure of one component or module will not result in total system failure of that CPE. Geo-diverse CPE switches must provide backup capabilities in a manner that does not drop a call. This requirement includes the ability to ensure that active calls on one switch are not “lost” due to a failure of that CPE. The second CPE must be capable of picking up the live call with minimal disruption and without disconnecting the parties on the call at the time of the error.

All vital system components must have protection from single component failure through the use of redundant components where appropriate to avoid a system outage.

### ***4.5 Future Expansion***

The hosted CPE must be capable of meeting today's needs, as well as future expansion in order to meet anticipated future growth. The initial configuration must not require a wholesale replacement or forklift upgrade to meet the expectations of growth identified as the PSAPs within the state of North Carolina. Wiring, processor capability and hardware design must be adequate to support up to 9% annual growth of the network upon installation:

- The hosted CPE must be capable of expansion to include the number of incoming 9-1-1 capacity (by either legacy 9-1-1 trunks or IP bandwidth), the number of answering positions, and the call volume.
- The hosted CPE design must be modular and based on open standards and industry best practices to accommodate additional functionality as it becomes available without requiring a major revision of the underlying system code of the CPE.

### ***4.6 Maintenance Access***

Maintenance personnel including the NMAC will require the ability to remotely access the hosted CPE and be able to perform, at minimum, the following tasks:

- Ability to:
  - View the system settings for each entity (such as 9-1-1 trunk and user)
  - Reconfigure advanced settings to adapt the system to the exact requirements without technical assistance from the manufacturer
  - Customize the operation of the hosted CPE according to the preferences of each PSAP
  - Safeguard the system by backing-up the system database
  - Troubleshoot the system
- Modify the quantity and function of answering positions parameters
- Modify the user login ID information and permissions
- Modify the 9-1-1 trunk parameters

## ***4.7 Instant Recall Recorder***

Call takers at the PSAP must have the ability to instantly play back the recording of any call from their assigned workstation. This includes calls not originally answered at their workstation.

The hosted CPE must include the methodology to complete an instant call replay. The Vendor of the Instant Recall Recorder (IRR) must provide documentation and training regarding the use of the IRR. The IRR must integrate with the existing operating environment within the PSAPs.

The hosted CPE must support IRR functionality between the components required (CAD, CPE, Logging). Initially the IRR will physically reside in the PSAP, but offered at a later time as a hosted component to the PSAPs.

Interface to the IRR system must utilize simple to use controls such as those utilized with a DVR. The user must have the ability to move to any portion of a call during the playback, and identify or mark a section of the call recording as needed. The hosted CPE must allow the call takers to play back a call that is still in progress; either to another PSAP workstation internal to that PSAP or to an external location reachable through the ESInet.

At a minimum, the IRR capability will provide the following features:

- Play
- Pause



- Stop
- Play forward/fast forward
- Mark
- Rewind
- Repeat
- Forward file to another position
- Display ANI
- Display Calling Line ID (if available).

## ***4.8 Logging Recorder Interface***

The hosted CPE must be capable of accommodating a variety of logging recorder configurations already in place at the PSAPs. Many PSAPs have an existing logging recorder that will remain in operation. PSAPs may choose to keep their logging recorder for a period of time, or have policy reasons for not joining a shared logging system. The hosted CPE must allow for a flexible interface to those logging solutions that are not centralized with the CPE unless they are incompatible with NG9-1-1 and non-upgradable. In these circumstances the hosted CPE must be configurable to utilize the local recorder.

## **5. CPE System Functions**

### **5.1 Call Presentation**

The hosted CPE will allow both audible and visual methods of notifying a call taker that a 9-1-1 call is incoming. Call takers must be able to hear the audible alert with or without a headset on and be able to clearly see a visual alert while they are at their workstation:

- Call takers must be able to answer a call with either a mouse, keyboard, or keystroke.
- The call presentation ability must be flexible to allow assignment of function keys for particular actions.
- Call takers must have the option of using either a handset or a headset at their workstation based on preference.

### **5.2 Call Taker Logon**

The hosted CPE must allow users to logon manually with a username and password combination. Upon successful completion of the logon, the CPE will present the call taker with a selection of preconfigured roles such as Fire Dispatch, Law Enforcement Dispatch, and Call Taker.

The screen layout presented to the call taker must be based on the role accessed through the log-on process.

- If a user or role combination has not been defined for a specific call taker, the screen layout presented to the call taker must be based on a default role defined by the PSAP.
- Call takers must be able to log-on at any position associated with the CPE and be presented with an identical screen layout associated with the selected role.

### **5.3 Ring-tone and Trunk-Line Functionality**

The hosted CPE must allow the ability to establish a distinctive ringtone. Ringtone distinctions must be customizable and configurable based upon the preferences of the PSAP.

The following are identified trunk lines that commonly use distinct ringtones:

- Audible and visual signals for 9-1-1 trunks that are different from other lines
- Dedicated supervisor line
- Non-Emergency lines
- Plain Old Telephone Service (POTS) lines
- Disaster lines
- Other specific lines identified for incoming calls

## **5.4 Call Answering**

The hosted CPE must allow quick identification and retrieval of calls in queue. The CPE configuration must be such that no 9-1-1 call can be and/or remain in a queue if there is an available call taker anywhere within the ESInet system. Management of this protocol requires:

- 9-1-1 will always take precedence over non-emergency, ring downs and alarm lines.
- The answering of a call will result in the display of the oldest call.
- CPE must support the ability for Automatic Call Distribution (ACD) for PSAPs having more than 3 positions.

## **5.5 Call Distribution**

The hosted CPE must allow for the distribution of calls to be configurable. Many PSAPs may require the routing of calls to a specialized call taker prior to routing to a dispatcher. In these cases, the hosted CPE must allow for call distribution to a call taker and transfer to a dispatcher.

Further call distribution capabilities include:

- The ability to override the call taking rules based upon extenuating factors which may require calls to be forced to a particular location
- The ability for emergency calls to integrate ten digit lines at the PSAP if necessary
- Indication of incoming emergency and non-emergency calls by both audible and visual means

- Visual display of the status of each emergency and non-emergency call (connected, ringing or on hold)
- A method for a supervisor or other authorized staff member to modify the system sounds and button icons to satisfy their local preferences

## **5.6 Routing Status**

The hosted CPE should include the ability for a visual display of the routing status of the call and be capable of sharing the information with the NMAC:

- Normal Status - the original attempt to route the call was successful.
- Overflow Status - the original attempted route was busy or congested.
- Alternate Status - the original attempted route failed or was unsuccessful and an alternate route was attempted.
- Transfer Status - the call was transferred.
- Not Available - no routing status was received.

## **5.7 Sound Quality**

The hosted CPE must accurately reproduce the sounds transmitted by any device creating a call. The hosted CPE must not introduce echo, static, interference, delay, or any other noise that reduces the ability of the parties on a call to communicate with each other.

## **5.8 Graphical User Interface**

The hosted CPE must include a Graphical User Interface (GUI) that allows a call taker to personalize the CPE screen layout according to the preferences of the individual PSAP. The GUI must allow for a quantity of windows to be located and docked in a position on the screen deemed most optimal by the supervisor.

- The hosted CPE must provide a user friendly, searchable help file accessible from the PSAP position.
- The hosted CPE screen layout must automatically lock in the call takers settings when the call taker logs into the answering position.

- Only the supervisor must have the ability to restore the original screen layout.
- The hosted CPE must ensure that an interface port for manual printing of location and TDD/TTY conversation or other media upon call release is functional at the PSAP.

## **5.9 Status Windows**

The hosted CPE should present the status of the following categories and be capable of sharing the information with the NMAC:

- Number of Active 9-1-1 Calls
- Number of 9-1-1 Calls on Hold
- Number of 9-1-1 Calls Ringing
- Number of Active Call takers

Users must be able to open up windows for each status category to obtain more information about calls in each category including:

- ANI data
- Trunk information
- Position and workstation identification
- Call taker identification

## **5.10 Automatic Number Identification (ANI)**

The hosted CPE must allow for a visual display of the emergency caller's telephone number and it must be viewable at the PSAP. The hosted CPE must be responsible for ensuring that the ANI display meets the NENA i3 compliant standards for ANI display.

## **5.11 Automatic Location Identification (ALI)**

The hosted CPE must allow for a visual display of the calling party's street address information based on legacy ALI. This display must be viewable at the PSAP. The hosted CPE must be responsible for ensuring that the ALI display meets the NENA i3 compliant standards for ANI display. In addition:

- The hosted CPE must provide the ability to extract geographical coordinate information from the ALI file received and allow the transmission of the information to geographical mapping software within NENA i3 standards.

- The hosted CPE must include training and document how ALI rebid may be configured by each PSAP as to the number and frequency of intervals on a per wireless provider basis.
- The hosted CPE must guarantee the appropriate and consistent display of ALI data when interfacing with different ALI providers that send their information in various formats (e.g., wireline versus wireless).

## ***5.12 Telecommunication Device for the Deaf/Teletype (TDD/TTY)***

The hosted CPE must ensure the capability of receiving calls from TTYs and present them to the remote PSAP. In order to ensure TTY remains operational the CPE must recognize baudot tones and display text, as well as accept typed text and generate baudot tones on either 9-1-1 calls or ten digit emergency lines. Many PSAPs utilize TTY for text services. The hosted CPE must ensure that the capability for receiving text to 9-1-1 is functional utilizing the hosted solution.

The following are additional specifications:

- Call takers must be capable of manually connecting to emergency calls originating from ASCII- type TDD/TTY equipment, as well as originating both baudot and American Standard Code for Information Interchange (ASCII) calls from their answering position.
- Call takers must be able to store and access a minimum of 20 preprogrammed TDD/TTY messages, as well as to print the previous TDD/TTY conversations.
- Call takers must have the ability to create a conference between the TDD/TTY caller and up to four non-TDD/TTY parties either in 9-1-1 call-taking mode or administrative call-taking mode.
- The TDD/TTY function must allow an operator to transfer a TDD/TTY call to another operator position.
- The TDD/TTY function must allow the call taker to alter its operation to comply with Americans with Disabilities Act (ADA) requirements for Hearing Carry Over (HCO) and Voice Carry Over (VCO) calls.
- The CPE shall also store any two-way TDD/TTY conversation and text information.

### **5.13 Hosted CPE System Capabilities**

The hosted CPE capabilities must at a minimum, deliver the same functionality as though the physical hardware and software were located at the PSAP. The CPE specification must include the following capabilities to ensure that the CPE performs as desired:

- The hosted CPE must allow the call taker to view the information of at least the last ten calls released at the answering position.
- The hosted CPE must allow for communication between workstations via broadcast messaging, or instant messaging from each PSAP workstation and be configurable or disabled according to individual PSAP requirements.
- All messages must be logged and accessible by a system administrator.

The hosted CPE must allow for automatic updates to the location information at regular intervals and in particular when connected to CAD based mapping solutions.

- The hosted CPE must allow the call taker the ability to remain on a call and add a new party to the conversation without putting the original caller on hold; the original caller must remain on the line at all times.
- At a minimum, the CPE must support up to ten simultaneous conferences of up to ten parties each with the allowance that individual parties may drop out without causing the entire call to drop.
- The hosted CPE must maintain a log of all calls and include the ANI/ALI information associated with the call.
- The hosted CPE must maintain call history by call back number.
- The hosted CPE must allow accessibility to call history.
- The hosted CPE must provide a clear display indicating which lines and or trunks are connected to an active call and demonstrate when a line has disconnected, either by the party or as the result of a forced disconnect.
- The hosted CPE must include status monitoring and display that presents the current status of the PSAP, including but not limited to: personnel on-duty, calls pending, calls active, abandoned calls, positions logged-on, positions available, positions busy.

- The hosted CPE will allow call takers the ability to refuse an incoming 9-1-1 call.
- The hosted CPE must allow a call taker the ability to barge into an existing call by clicking on the appropriate indicator on their screen or pressing the appropriate line appearance on the telephone.
- Any authorized call taker or supervisor will have the ability to silently listen to another call taker's telephone conversation.
- Call takers must have the ability to update their availability to answer calls without having to completely log out.
- Call takers must have the ability to add comments to a phone record that will automatically display on future calls from that phone number.
- The hosted CPE must include the ability to alert call takers, both visually and through a distinct tone, of a call that was abandoned and allow callback with a single action.
- The hosted CPE must provide that all abandoned calls display clearly and distinctly for the call-taker with ANI/ALI information.
- The hosted CPE must provide logging of call-handling activities.
  - The logs must be accessible from a centralized location and available through the system's reporting feature.
  - At a minimum, logs must capture login and logout, non-9-1-1 associated calls, and other such events.
- Call takers must be able to mute any participant in a conference and must be able to exclude any participant from hearing other parties in the conference to allow for private consultation if necessary.
- Call takers must have the ability to block a caller from hearing and talking during a conference.
- Call takers must be capable of releasing an existing E9-1-1 call at any time.
- A speed dial function must be implemented with a preprogrammed list of contacts.



- Call takers must have the ability to initiate a speed dial simply by clicking on an icon.
- Call takers must have the ability to transfer calls to other PSAPs utilizing a list for preprogrammed star codes.
- The hosted CPE must have the ability to callback a 9-1-1 caller by dialing the ANI received during the call setup.
- All answering positions connected to the CPE must permit the call taker to place up to five 9-1-1 or administrative calls on hold.
- The hosted CPE must store the ANI/ALI information while the call is on hold.
- Call takers, with appropriate system permissions, will be capable of temporarily removing themselves from a ring group (call queue) in order to conclude a previous call or perform another task such as radio dispatch while remaining logged on.

Call takers will have the ability to click a single "Make Busy" icon to remain logged on but not in a queue to receive calls.

## **6. CAD Interface**

The hosted CPE must support a direct interface to the existing CAD system(s) in operation at the PSAPs. A seamless interface that permits full system integration between the CAD system and CPE to support the delivery of all calls to a PSAP regardless of type, version and method of CAD must be available.

The hosted CPE must allow the transfer of call information via CAD to external systems, consistent with applicable standards, guidelines and/or best practices, as they now exist or may exist in the foreseeable future.

## 7. Management and Monitoring Requirements

### 7.1 Administrative Monitoring

Monitoring of the hosted CPE must occur on a 24x7x365 basis. The hosted CPE must allow administrative and operational oversight and coordination by the NMAC. The CPE Vendor must provide access to their monitoring tools and integrate any such tools with the NMAC.

Management of the CPE will be according to a typical ITIL framework which includes the following levels of severity to guide operations support:

1. Severity level 1
  - a. 1st Level Support / response – within 15 minutes
    - i. Continuous problem resolution/workaround effort until issue is resolved or recovered
  - b. 2nd Level Support – within 2 hours
  - c. 3rd Level Support – within 4 hours or upon Customer request
2. Severity level 2
  - a. 1st Level Support / response – within 15 minutes
    - i. Continuous problem resolution/workaround effort until issue is resolved recovered
  - b. 2nd Level Support – within 4 hours
  - c. 3rd Level Support – within 8 hours or upon customer request
3. Severity level 3
  - a. 1st Level Support / response – within 30 minutes
  - b. 2nd Level Support – within 8 hours
  - c. 3rd Level Support - within 12 hours or upon customer request
4. Severity level 4
  - a. 1st Level Support / response – within 1 hour
  - b. 2nd Level Support – 12 hours
  - c. 3rd Level Support – within 24 hours or upon customer or management request

## ***7.2 Monitoring of Applications and Equipment***

Proactive monitoring of all system components for operation, performance and fault conditions is mandatory. Monitoring must ensure receipt and delivery of all hosted CPE alarms to the NMAC.

## ***7.3 Simple Network Management Protocol Version 3 (SNMPv3) Support***

The hosted CPE Vendor must be prepared to support the Simple Network Management Protocol version 3 (SNMPv3) specification for performance monitoring via standard management information base (MIB) objects.

## ***7.4 Network Fault Monitoring***

The hosted CPE must include the ability to monitor the NG9-1-1 network for faults that impede or disable the ability for 9-1-1 call delivery. The detection method must log all network problems including IP network problems. Upon identification of a problem, the NMAC and the PSAP must receive a notification.

## ***7.5 Network Performance Monitoring***

All variables that affect the CPE performance, including the ability of the CPE to utilize the network and the ability to provide call delivery through the NG9-1-1 services and system must be measured.

The CPE must include a capability for remote monitoring access by the Vendor to aid in detecting any issues and or potential problems that can be seen and remotely addressed.

## ***7.6 Maintenance Support***

Physical maintenance will be performed by trained and certified technicians who, if required, will be on site within 4 hours of a reported Level 1 maintenance issue.

## **8. Operations**

The hosted CPE operational information must be collected and reported to the NMAC. The report should allow for filtering and sorting of all data relevant to the operation of the hosted CPE and the connected PSAPs. The following details will be suggested as reporting requirements:

- The hosted CPE report must show, for example, all activity including calls by PSAP, calls by class of service, calls by date, calls by time and calls by day of the week.
- CPE statistics such as average time to answer and average call length must be available.
- CPE reports must be available to the NMAC via the system's reporting feature.
- A status report of all PSAPs and call takers must be provided to show staffing levels and call takers on duty for any given time period. This report capability must be dynamically creatable by the NMAC or system administrator through the hosted CPE reporting feature.
- A CPE event log report capability must be included. This report must show recorded events and be available to the NMAC or a system administrator through the CPE reporting feature.
- The hosted CPE reporting feature must include the ability to create ad hoc reports based upon user defined criteria. This tool must be available to the NMAC or the system administrator.
- The CPE must include the ability to report on service anomalies, irregularities and disturbances that result from a technical or operational nature.

### ***8.1 First-Echelon Troubleshooting***

The hosted CPE must include the ability to allow for first echelon troubleshooting by the NMAC. The NMAC must coordinate all troubleshooting activities with the CPE provider and supply additional support within their realm where necessary.

### ***8.2 Customer Service Plan***

The hosted CPE must be accompanied with a customer service plan that governs the continuity of operations and maintenance of the system. The customer service plan will

include criteria that defines the service levels as defined in the specification (i.e., minor, major and critical)

### ***8.3 Warranties***

The warranty period must be a minimum of 1 year, commencing from the date of system acceptance (not the date of delivery). The hosted CPE equipment list and all associated warranty information will be to enable the documentation and tracking of all warranties by the NMAC.

### ***8.4 Updates, Upgrades and/or Replacements***

The hosted CPE must include any updates planned within the CPE roadmap provided during the procurement. The NMAC will use this documentation to ensure that all CPE components are operating within the current parameters.

### ***8.5 Maintenance Spares***

The hosted CPE will include a list of all maintenance spares, where those spares are located and quantities of each item. The NMAC will assist in ensuring the quantities of spares remains sufficient and will assist the CPE Vendor in maintaining the spare inventory. The spare inventory must be located within a 2 hour drive of the CPE equipment to ensure a quick repair or replacement of the malfunction.

Spares must include all critical system components, including but not limited to:

- Network routers
- Network hubs
- Server hard drives
- Jack-boxes
- Gateways
- Monitors
- Fully equipped workstations
- Integrated & stand-alone power supplies
- ACD circuit cards
- Audio interfaces
- Operating system and application recovery tools